MINISTRY OF TRANSPORTATION

Road Talk

Ontario's Transportation Technology Transfer Digest • Winter 2009 • Vol 15 Issue 1

2 In-Place Resonant Rubblizing (continued)

3 Corrosion Inhibitor Tests

4 Sioux Narrows River Bridge

5 Highway 69 Track Settlement Sensor

6 ABC Knowledge Transfer

7 Winter Maintenance Symposium

In-Place Resonant Rubblizing

In-place resonant rubblizing uses a 44 Hz frequency on a 200 mm shoe to precisely shatter concrete pavement.

Concrete pavement rehabilitation typically involves methods that are labour intensive, time-consuming and increasingly expensive. Traditional reconstruction involves fracturing existing concrete pavement and then removal of the fractured material. Different techniques have been developed to shatter the existing concrete pavement, leaving the material in place to create a subgrade to support the new driving surface. One method uses multiple impact hammers which generates a high volume of construction noise, adversely affecting neighbouring properties. It is time consuming and produces various success rates. In-place resonant rubblizing is an innovative alternative method which is increasing in popularity.

In-place resonant rubblizing uses a hydraulic concrete breaking system that fractures the existing concrete pavement, producing a more uniform result. This method is more efficient, reduces construction time, and results in significant cost savings. MTO has used in-place resonant rubblizing to reconstruct Highway 58 in the Niagara region.

In-place resonant rubblizing also uses a beam to project a resonant frequency onto a steel shoe for concrete breaking. Rubblization has been successfully carried out on concrete pavements up to 660 mm thick. A 200 mm shoe extends out from a tractor type unit and is attached to a counterweight near the operator's cabin. The unit is electronically controlled and projects a downward force with a frequency of 44 Hz onto the shoe. This combination precisely shatters the concrete pavement.

In cases where a road base is not weak or damaged, rubblizing is an excellent solution for concrete pavement reconstruction. Ideal conditions for in-place rubblizing include:

- Patching greater than 10%
- Severe D-cracking
- Severe ASR or ACR cracking
- Dowel bar locking
- Severe joint deterioration
- Persistent faulting
- Reflective cracking

Road Talk is prepared and published quarterly by the Division Services Office, Provincial Highways Management Division, Ontario Ministry of Transportation. Road Talk is distributed electronically in both PDF and HTML forms and is available at:
www.mto.gov.on.ca/english/transtek/roadtalk.

Road Talk est aussi disponible en français:
www.mto.gov.on.ca/french/transtek/roadtalk.

This publication reports on innovations and new technology relating to highway management, the design, construction, operation and maintenance of highway infrastructure.

Readers are encouraged to submit articles, news items and comments to

Kristin MacIntosh, Editor, at:
Division Services Office
Provincial Highways Management Division
Ontario Ministry of Transportation
4th Floor, 301 St. Paul Street
St. Catharines, ON, Canada L2R 7R4
Phone: 905.704.2645
Fax: 905.704.2044
Kristin.MacIntosh@ontario.ca

Crown copyright reserved, Ontario Ministry of Transportation. Contents of this newsletter may be reproduced with appropriate attribution to the ministry. Please send a copy of the reprinted article to the Editor.

Opinions, conclusions, or recommendations found herein are those of the authors and do not necessarily reflect those of the Ontario Ministry of Transportation. Products referred to in this publication are for information purposes only and should not be considered a product endorsement.

Road Talk Advisory Committee

Kristin MacIntosh, Editor, Division Services Office

Brian Jansen & Kristyna Wilson, Junior Writers/Editors, Division Services Office

Mike Goodale, Director, Contract Management and Operations Branch

Gerry Chaput, Chief Engineer, Director Highway Standards Branch

Steve Holmes, Senior Engineer, Highway Standards Branch

Patrick Hellerty, Program Development Officer, Kingston, Eastern Region

Dan Preley, Project Engineer, Thunder Bay, Northwestern Region

Vic Ozymtchak, Maintenance Officer, Highway Standards Branch

Melissa Titherington, Concrete Engineer, Highway Standards Branch

Finlay Buchanan, Co-ordinator, Technology & Innovations, Executive Director's Office

Before the rubblizing can begin, any existing asphalt pavement overlay must be removed.

Rubblizing is carried out beginning at either the centerline or the outer edge of the pavement in thin multiple passes. Loose edges, such as the edge of pavement or a broken centreline joint, may require a second pass to achieve the desired particle size. When the rubblizing operation is complete, any exposed steel is cut and removed. Poorly performing areas are excavated and backfilled. The rubblized surface is then rolled using a vibratory drum prior to placing the new pavement.

For the Highway 58 project, the rubblized surface was covered with 50 mm of Granular 'A' to provide a uniform surface plus additional granular for geometric corrections. Three lifts of SuperPave Hot Mix were then applied over the new subgrade. The existing concrete pavement depth on Highway 58 was 220 mm with a lane width of 3.75 m. The rate of rubblizing was 2.5 hours per lane km.

"In-place resonant rubblizing uses a hydraulic concrete breaking system that fractures the existing concrete pavement, producing a more uniform result."

The ministry estimates that in-place resonant rubblizing on Highway 58 saved approximately 21,000 tonnes of granular material, over $1 million in contract costs, and 40 construction days.

No noise complaints were made by residents adjacent to the construction site while the rubblizing operation was carried out.

Rubblizing can be used in many different weather conditions and requires minimal labour, reducing costs and road closure time. Installation of roadway subdrains may be required as experience has shown that a dry subgrade produces better results. In contrast to conventional methods, such as full-depth concrete removal, in-place resonant rubblizing requires less labour, time, heavy equipment, and raw material, making it a greener approach to pavement reconstruction.

This highly sophisticated method of concrete pavement reconstruction fractures pavement without altering the integrity of its base, potentially saving time and money while minimizing impacts on the environment. ●

Rubblizing is carried out beginning at either the centerline or the outer edge of the pavement in thin multiple passes.

For more information, contact Dustin Hamon, Transportation Technician, Contract Management & Operations, at Dustin.Hamon@ontario.ca or (905) 680-8053

Technology Transfer is a communication process by which information, regarding an improvement in a product or method, is exchanged and implementation into practice is facilitated.

Ontario

Corrosion Inhibitor Tests: The Results Are In

In 2000, winter road maintenance liquids—salts diluted in water—were introduced into MTO's snow and ice control program after testing had confirmed that they increased the effectiveness of road salt and helped to reduce overall salt consumption. However, contractors voiced concerns that the liquids may increase corrosion on their vehicles. Therefore, in a proactive effort to decrease corrosion caused by winter maintenance liquids, the ministry adopted a requirement that winter liquids be 70% less corrosive than road salt. This requirement was met through the addition of inhibitors to winter maintenance liquids and verified through lab tests developed by the Pacific Northwest Snowfighters (PNS).

Corrosion is both a chemical and electrical process, and is affected by changes in the pH of water. When chloride salts are added to water, the rate of corrosion on metals increases. Inhibitors seek to slow down this corrosion process. The addition of inhibitors to the liquids, however, also leads to an increase in their overall price. Some chlorides require large amounts of inhibitor to be added in order to meet the 70% reduction benchmark.

To verify the cost-effectiveness and efficiency of inhibitor use in the liquid program as a method of reducing corrosion, lab and field tests were conducted during the winter of 2006. For more information on the details of these tests, see the article "Corrosion Inhibitors Test: MTO Test for Optimal Winter Inhibitors Level" in the Winter 2007 issue of Road Talk. These tests consisted of a series of alternating steel and aluminum coupons, which were suspended on threaded nylon rods. The rods were installed in patrol areas using different winter maintenance liquids with varying levels of corrosion inhibitors for evaluation. The results of this study were inconclusive: in some cases the inhibitor appeared to successfully reduce corrosion, while in other cases, it appeared to actually increase corrosion.

Unsatisfied with the initial results, MTO continued the study. The lab and field tests were repeated in 2007 with improvements in the test setup and an increase in coupon quantities and test sites. Test sites included patrols in Ottawa, Chatham and Kenora; 800 corrosion coupons were used in total. At the end of the winter season, the corrosion coupons were collected, cleaned and weighed for final analysis. Upon review of the data, the inhibitors did not appear to deliver the expected reduction in corrosion rates. Similar to the 2006 study, several of the inhibited chlorides appeared to work well in the lab tests, but were associated with increased levels of corrosion in the field as the levels of inhibitor were increased. Studies by other road authorities indicated similar results. At present, there is no clear consensus on the benefits of the use of inhibitors.

As a result of the most recent study, MTO has decided to allow liquid suppliers the option of including or not including corrosion inhibiters in winter liquids. This decision will create opportunities to explore a more practical and efficient method for solving this problem, benefiting both the ministry and the public. ●

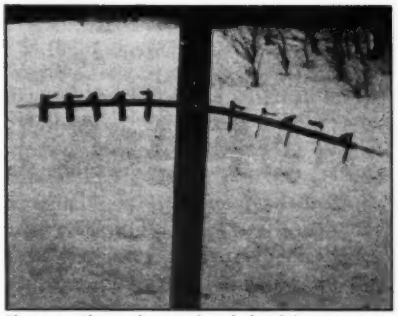

Figure 1: Alternating steel and aluminium coupons suspended on threaded nylon rods for field testing in Ottawa.

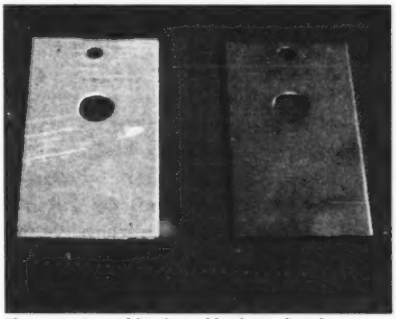

Figure 2: A combination of both steel and aluminium coupons were used in lab and field tests.

For more information, contact
Steve Birmingham, Maintenance Officer,
Highway Standards Branch,
at (905) 704-2852 or
Steve.Birmingham@ontario.ca.

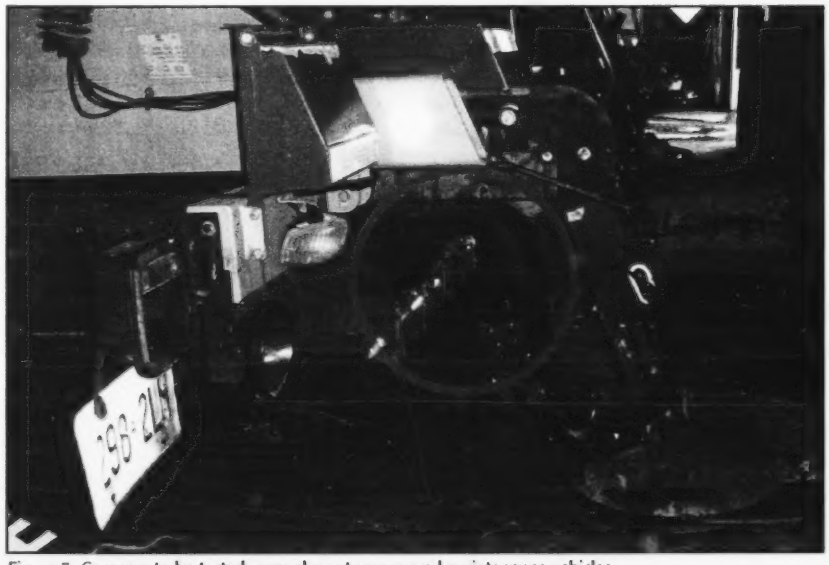

Figure 3: Coupons to be tested were also set up on road maintenance vehicles.

Preserving History:

The Sioux Narrows River Bridge Replacement

The Sioux Narrows Bridge, a 64 m long, single-span, timber truss bridge spanning a narrow in the Lake of the Woods was, at the time of its construction in 1936, one of the longest of its type in the world. It was added to the Ontario Heritage Bridge List in 1983 for both its outstanding features and its cultural significance. The bridge remains a cultural landmark for the municipality of Sioux Narrows and an important transportation connection in Northern Ontario.

In 2002, however, an attentive MTO structural engineer discovered unusual distortions in the top compression chord of the bridge. The distortion was first discovered during an aerial inspection of the Sioux Narrows area for flood damage, instigating further ground-based surveys of possible damage.

Upon completion of these surveys, it was determined that the top chords were up to 450mm out of plane, and had developed parallel S-shaped curves. MTO's structural engineers immediately began to investigate and assess their options in repairing or replacing the bridge.

This investigation included both visual observation as well as coring and decay analysis. Inspections revealed compression failure zones, extensive decay in the trusses of the bridge, and a lack of fit between components due to the age and service time of the original bridge. It was determined that in any extended duration, the load effect would continue to reduce the strength of the bridge. The trusses of the bridge were not only stressed but showed evidence of progressive collapse. MTO took action immediately; steps were taken first to lighten the load on the bridge, then to build a detour bridge, and ultimately to replace the Sioux Narrows Bridge altogether.

The first steps implemented to lighten the load on the bridge were reducing traffic to a single lane and removing the asphalt surface. However, the trusses continued to deteriorate, demanding further action. Heavy trucks were restricted and the bridge was eventually braced internally. Anticipating these potential problems early on, MTO had planned the detour bridge's completion for the end of 2003. This modular Acrow detour bridge was constructed with steel and concrete substructures, rock embankments, prefabricated bridge launching, rock fills and retaining walls in only three months. The bridge was used by travellers while the original bridge was being dismantled and replaced.

The construction of the replacement bridge held many more obstacles in planning than the detour structure, especially given the cultural significance of the original. Planning this replacement included public consultation to consider environmental, aesthetic, and historical issues. As a heritage structure, replacement of the Sioux Narrows Bridge was dictated by nine possible conservation measures set up by cultural heritage authorities. Ultimately, MTO opted to remove the bridge and replace it with a structure that would evoke the original. This involved constructing a steel-plated girder bridge and superimposing non-functional trusses using material salvaged from the original bridge.

Because parts of the original bridge would be used, dismantling the old Sioux Narrows Bridge became a precise undertaking: barges, scaffolding and hydraulic jacks were used to float the bridge successfully off its bearings, at any water level. After dismantling the bridge and examining the remnants, it was discovered that there was more decay in the pieces than anticipated. Consequently the amount of salvage was scaled back and most of the decorative timber cladding used in construction was comprised of new engineered wood.

The final replacement bridge featured a concrete deck, a 3-span steel girder, a concrete substructure support, sidewalks on the sides, haunched girders, and timber-faced truss pieces to imitate the aesthetics of the original bridge. The timber was pressure treated with preservatives to increase its durability and prevent future deterioration. It was also striated to prevent warping and the steel skeleton was galvanized for longevity. The steel truss was analysed as a 3D space frame and the timber installation sequence was detailed to ensure no stresses were imparted upon the timber. To contribute to its accurate reproduction of the first Sioux Narrows Bridge, steel hanger rods from the original bridge were used in a non-functional capacity.

The new Sioux Narrows Bridge, which opened in October 2007, maintains both the transportation connection in Northern Ontario and the heritage of a bridge highly valued by the community of Sioux Narrows. Through consultation and careful planning, MTO was able to maintain the important aesthetic and cultural features of the original Sioux Narrows Bridge—almost 7 decades old—with a replacement bridge designed to last even longer. ●

The Sioux Narrows Bridge, circa 1936.

This article is based on and references "Skillful Substitution," by Reno Radolli, P.Eng., and Raymond Krisciunas, P.Eng., which appeared in the June 2008 (Vol. 78, Iss. 6) issue of *Civil Engineering*, the online magazine of the American Society of Civil Engineers.

For more information, contact Ray Krisciunas, Head, Structural, Thunder Bay, at (807) 473-2064 or Ray.Krisciunas@ontario.ca

24/7 Monitoring Keeps Highway 69 Project on Track

The expansion of Highway 69 to 4 lanes over a 20 km length, from approximately 4 km south of Estaire to 1 km north of Highway 537, includes a CN rail track crossing situated in a swamp area. Two parallel four span overhead structures will carry new Highway 69 northbound and southbound lanes over the swamp and rail tracks. Because four of the proposed piers are located within CNR's right-of-way (ROW) and are very close to the tracks, construction planning had to be managed to avoid causing subsurface settlement of the tracks. In addition, CNR required real-time confirmation that settlement had not occurred. To address these issues, a state-of-the-art web-based track settlement sensors (TSS) monitoring system was designed and implemented to monitor track settlements.

Of concern was the impact that the pier construction and installation of driven piles at this site would have on the safety and serviceability of the CNR track. Any interruption to the railroad service had to be prevented to avoid costly disruptions to the CNR service and also to avoid contractual delays. With the rail line being a busy CN route with an average of 19 trains per day, any interruption would have significant cost implications. CN estimates that the cost of shutting down the tracks entirely would be over a million dollars per day.

During detail design, CN specified that the acceptable differential settlement along any 2 m section of track was to be less than 15 mm and that 24/7 instrumentation monitoring be conducted to verify the track settlement during pier construction. CN also specified that a contractor be made available 24/7 for lifting/repairing the track if required.

To determine the surface and subsurface conditions at the CN track and at the bridge foundation locations prior to construction, a comprehensive foundation investigation, consisting of 30 sampled boreholes, was conducted within the swamp area. The investigation established that the swamp consists of a thick layer of peat up to 5.8 m thick, underlain by a deposit of loose sand and silt. The sand and silt deposit was up to 5 m thick under the CNR track. A deposit of silty clay to a maximum thickness of more than 30 m underlies the peat and the sand/silt deposits. The overburden at the site is underlain by bedrock.

The primary technical concern during construction was the settlement of the track due to vibrations associated with the pile driving. In particular, the foundations for the piers located immediately south and north of the tracks required steel piles to be driven 40m into bedrock which imposed a high risk of generating vibrations from the pile driving operation. In addition, settlement monitoring was required during the installation of the track protection and dewatering required for the excavation to construct the piers.

Pore water pressure in the foundation soils were measured using Vibrating Wire Piezometers (VWP). Vibration monitoring was carried out using seismographs similar to the seismographs used to monitor vibrations caused by blasting. A Pile Driving Analyzer (PDA) was used to measure the energy imparted by the pile driver.

The monitoring system is distinguished by a state-of-the-art web based track settlement sensors system used for the first time on an MTO project. The TSS used in combination with a conventional level survey of settlement points enables remote monitoring of real-time measurements from any location just by logging on to a computer. The TSS consists of steel rods connected in series and each rod is equipped with an electrolevel sensor. The electrolevel sensors measure the inclination of the steel rods and allow the assessment of differential settlement along the rods. At the CNR Crossing project two clusters of TSS, each consisting of ten 2 m-long rods, were installed between and along the tracks enabling precise and continuous monitoring of settlement.

The TSSs and the VWPs were hardwired to data loggers that were installed in a protective shed. The data loggers were programmed to take settlement and pore water pressure readings every minute, 24 hours a day, and 7 days a week. The data collected is wirelessly transmitted from the site to Argus, a web-based system based in Vancouver. This system automatically processes readings, checks for alarms, displays graphs, and generates reports in real time. Users anywhere can log on to view data and graphs with their web browsers.

Between October 2007 and March 2008, approximately 2.3 km of steel pile were driven to provide the foundation for the four piers within the CN ROW. The TSS system was successful in providing

...Continued on page 8

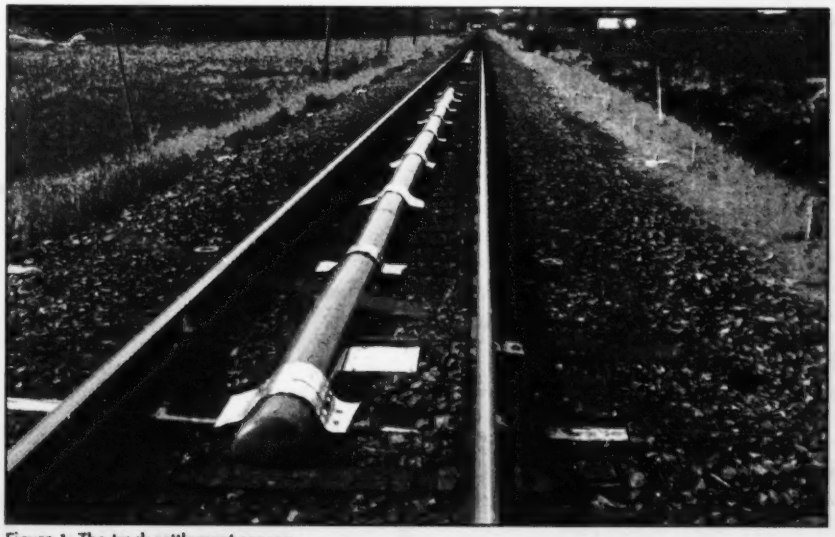

Figure 1: The track settlement sensor.

The ABCs:

MTO's Accelerated Bridge Construction Knowledge Transfer Event

On August 1st, MTO held an Accelerated Bridge Construction (ABC) Knowledge Transfer Event in Ottawa. The event coincided with its most recent application of p refabrication technology: the rapid replacement of the Clyde Avenue Bridges—the latest in a series of bridge replacements along Highway 417, between Maitland Avenue and Island Park Drive.

The goals of the event were to transfer knowledge to the transportation industry, communicate lessons learned and effective contract requirements to ensure project success to road authorities interested in using ABC techniques, and support MTO's mission of pursuing and implementing leading edge innovation. Over 130 individuals representing a diverse cross-section of transportation professionals—including MTO employees, prefabricators, contractors, municipal, provincial, federal and international road authorities, and students and faculty from Ontario Schools of Engineering—attended to discuss expedited bridge construction, the Highway 417 bridge replacement project, and both the benefits of, and issues facing, the development and implementation of ABC.

After initiating a laboratory research program in 2001 to investigate its use in bridge construction and rehabilitation, MTO officially began using ABC technology as a mainstream tool in 2004. Since that time, MTO has completed 17 ABC projects, with several more currently in design and under construction.

Last year, MTO combined prefabrication with rapid replacement technology to replace the nearby Island Park Drive Bridges. Rapid replacement is one of several ABC techniques, in which the prefabrication takes place in a nearby staging area, before being carried to the site by Self Propelled Modular Transporters (SPMTs) and installed (for more information on the Island Park Drive Bridges Replacement, see "Success! Island Park Bridges Rapidly Replaced Within 15 Hours" in the Fall 2007 issue of Road Talk).

The Knowledge Transfer Event began with an overview of Accelerated Bridge Construction and successes to date in Ontario. Bala Tharmabala, Manager of MTO's Bridge Office, outlined the needs that spurred the development of prefabricated bridge technology—rising traffic volume, traffic delays, and the province's aging infrastructure—and enumerated its benefits:

- Increased product quality
- Minimized traffic disruption
- Improved lifecycle costs
- Reduced environmental impact
- Increased worker safety

Participants discussed the unique aspects of MTO's previously completed ABC projects, including Sucker Creek Bridge and Passe-à-Fontaine Bridge, identified future prefabrication projects, and outlined directions for prefabrication. The Knowledge Transfer Event stressed the importance of building relationships and developing innovation through a viable prefabrication industry for bridges and standardized bridge elements.

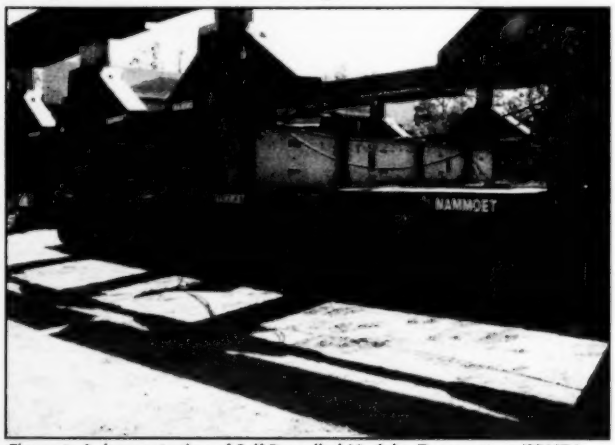

Figure 1: A demonstration of Self Propelled Modular Transporters (SPMTs) for event attendees.

Frank Vanderlaan, Area Contracts Engineer for MTO in East Region, provided a summary of the Highway 417 Queensway Bridges Project. Michel Vachon, Manager of the Structures Group for McCormick Rankin Corporation, offered the wisdom gained from last year's Island Park Drive Bridges replacement, highlighting the importance of coordinating road closures with the municipality, and improved communication between stakeholders. The project ultimately saved an estimated $2.4 million over traditional construction, reducing a two-year construction schedule to just 15 hours.

The event also featured a presentation by Glen Aitkin, Vice President Sales for Mammoet Canada, the heavy lift contractor who supplied the SPMTs used in the Island Park Drive and Clyde Avenue bridge replacements. Known internationally for raising the sunken Russian submarine Kursk in 2001, Mammoet specializes in heavy lifting projects for petrochemical, offshore, power, and civil industries.

An SPMT is a very manoeuvrable platform vehicle used for transporting large objects like bridges, made up of modules with 4 to 6 axles and rubber tires that are able to turn 360 degrees. Depending on the size of a load, as many modules can be added as needed; with so many wheels, the actual weight of a load on road surfaces is similar to that of a truck traveling on a highway.

The day finished with a visit to the nearby staging area; participants saw the off-site property where the new Clyde Avenue Bridges had been constructed, and where the old bridges would be placed, awaiting demolition.

Overnight on August 2-3, the rapid replacement of the Clyde Avenue overpass was successfully carried out. A gathering of invited guests and local onlookers watched as SPMTs removed the old bridges and replaced them with new structures,

...Continued on page 8

MTO's Annual Winter Maintenance Symposium

As part of MTO's continuing commitment to ensuring safe and clear winter roadways, a Maintenance Technology Project (MTP) Symposium was hosted in Toronto this past May. The Maintenance Technology Project is MTO's active research venue to improve road safety through the technology transfer of maintenance operations. MTP is a province-wide partnership among MTO head office, regional offices, service providers, Area Maintenance Contract (AMC) and Managed Outsourcing (MO) contractors, consultants, and universities. By identifying, evaluating and demonstrating technology, materials and information systems, the goal of the MTP symposium is to improve the effectiveness, safety and efficiency of winter operations and maintenance services on provincial highways.

At the 2008 MTP symposium, participants focused on reducing salt use, improving contract operations oversight and outcome reporting. This was accomplished through presentations of current research, question and answer periods, roundtable discussions, and an in-house vote called a dotmocracy, to provide a consensus on the results and rank the importance of the issues covered throughout the day. The symposium's objectives were to:

1. Establish a vision for technology in highway maintenance.
2. Review project achievements for winter 2007-2008.
3. Review national and international highway operations research.
4. Recommend technologies for implementation.
5. Solicit and review new ideas.
6. Develop priorities for ongoing and new work.

The first issue addressed concerned MTO's use of winter liquids. Pre-wetting and direct liquid applications have been used routinely in Ontario since 2002 and sufficient experience has been gained to review whether anticipated benefits have been seen. The consensus was that the expected benefits of pre-wetting and direct liquid application techniques are being met. The decision was made to continue use of direct liquid applications during winter maintenance operations to help maintain bare pavements and reduce roadway incidents. Research being conducted by the University of Waterloo is expected to aid in refining road salting procedures by applying a decision tree analysis to records of past operations. Another discussion regarding winter liquids addressed the use of corrosion inhibitors. For more information on corrosion inhibitors, see the article "Corrosion Inhibition Tests: The Results Are In" in this issue of Road Talk.

The symposium also discussed contract administration. Active Automated Vehicle Location systems (AVLs) use GPS technology to track highway maintenance vehicles in real time. In comparison with the winter operations record, active AVLs were favoured to collect and archive paperless data regarding winter contract accomplishments and road salt management. Passive AVL is another alternative which may be more cost effective. It functions in the same way as active AVL, but only provides data when the truck returns to the yard, rather than in real-time as the truck is on the road. Dotmocracy results at the symposium showed that passive AVL is preferred to active AVL units.

A presentation on Seasonal Load Adjustment reported on progress in developing a web-based system to provide measurements and forecasts of ground frost levels and thaw depths to help in setting start and end dates for Spring Load Restriction on low volume roads used for hauling resources. It was agreed to continue development of this system.

The two-lane Tow Plow and hot water sanding were also addressed. The Tow Plow was voted to be permitted in MTO contracts as an option for contractors, while the hot water sander will be evaluated further, with possible plans for testing in Northwest Region and possible implementation in Northeast Region.

A few new projects were highlighted and the potential of the heated pre-wet was voted to be put on the technology evaluation program. It has the potential to further protect the environment by using heated water, rather than chloride brine for pre-wetting rock salt. Issues affecting the implementation of research on this project include the types of applications, and the equipment availability in Northeast Region, where testing was recommended.

The May symposium came to a close with clear conclusions and a set of recommendations for the topics discussed. The consensus of symposium participants suggests broad support for MTO's commitment to economical and environmental sustainability, in both its technology development and its roadway maintenance operations. ●

For more information, contact
Steve Birmingham, Maintenance Officer,
Highway Standards Branch,
at (905)-704-2852 or
Steve.Birmingham@ontario.ca.

Reader Response

Please help Road Talk become more effective

Send us any ideas, comments, or suggestions concerning local innovations, workshops, or seminars that you would like to see included in future issues.

Road Talk is also available in French.

By Email:
Kristin.MacIntosh@ontario.ca
By Mail:
Ontario Ministry of Transportation
Division Services Office
4th Floor, Garden City Tower
301 St. Paul Street
St. Catharines, Ontario, L2R 7R4
By Fax: 905-704-2044

Highway 69 Track Settlement Sensor

(continued from page 5)

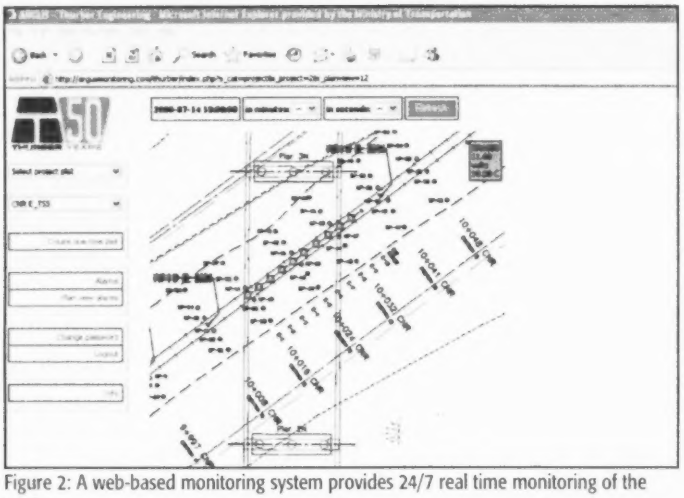

Figure 2: A web-based monitoring system provides 24/7 real time monitoring of the tracks.

continuous monitoring of the track performance throughout the piling operation. The CN track performed within required limits throughout the piling, track protection and dewatering operations. Settlements measured were less than 6 mm, well below the 15 mm review level.

The Hwy 69/CNR project demonstrates the benefits of team collaboration and commitment to quality and excellence. MTO and CN worked together to develop a plan designed to satisfy specified requirements and to protect the interests of all stakeholders. The system enabled CN rail to operate safely and without delay and interruption. In turn, the MTO contract was not subjected to potentially expensive contractual claims.

The development of the monitoring system illustrated a successful partnership between the Prime Consultant (Totten Sims Hubicki), the Foundations Engineering subconsultant (Thurber), Northeast Region Planning and Design, Northeast Region Construction and the Pavements & Foundations Section. The installation of the monitoring system was carried out by Slope Indicator Company and Thurber Engineering Ltd retained by Tulloch Engineering who is the Contract Administrator for this project.

The planned opening for this section of highway is scheduled for 2010. ●

For more information on Highway 69 Four-Laning visit: http://www.mto.gov.on.ca/english/traveller/highway69

For more information, contact Tony Sangiuliano, Materials Engineering and Research Office, at (416) 235-5267 or Tony.J.Sangiuliano@ontario.ca.

Upcoming Conferences

Association of Asphalt Paving Technol (AAPT) Annual Meeting
March 16-18th, 2009
Minneapolis, Minnesota

National Conference on Preservation, Repair and Rehabilitation of Concrete Pavements
April 22-24, 2009
St. Louis, Missouri

12th National Transportation Planning Applications Conference
May 17-21, 2009
Houston, Texas

Canadian Transportation Research Forum (CTRF) 44th Annual Conference
May 24-27, 2009
Victoria, British Columbia

Accelerated Bridge Construction

(continued from page 6)

designed to last 75 years. The replacement went so well that MTO was able to reopen the highway to traffic nearly two hours ahead of schedule. The entire process was captured live, by both MTO webcams and the local community television station.

Like the bridge replacement that followed, the ABC Knowledge Transfer Event went off without a hitch, effectively meeting its primary goal. A post-event questionnaire demonstrated that participant's knowledge of ABC technologies increased from Low-Medium prior to the event to Medium-High after the event.

MTO used the successful implementation of rapid replacement technology to champion its adoption—maintaining a longstanding commitment to technology transfer and fostering an environment of innovation that extends beyond the walls of the ministry. ●

For more information, contact Finlay Buchanan, Coordinator, Technology & Innovations, Executive Director's Office, at (905) 704-2980 or Finlay.Buchanan@ontario.ca

For more information on the Highway 417 Queensway Bridges Project, visit: http://www.417queenswaybridges.ca/.